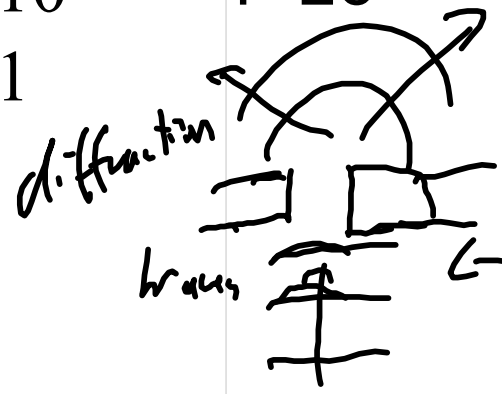
Test Friday Ch14,15,16

Electromagnetic Radiation - EM rad

Types p 330

types of EM	λ (m)	f (Hz)	notes
Radio waves	$\lambda > 10^0$ $\lambda > 1$  $v = \lambda f$	$f < 10^8$	radio stations 104.9 FM = 104.9 MHz AM = kHz AM diffracts better and reflects off the atmosphere
Microwaves	$1 - 10^{-2}$	10^{10}-10^9	cooking, cell phones, Wifi
infrared	$10^{-2} - 10^{-5}$	10^{10}-10^{14}	night vision cameras, remotes, thermal, absorbed by greenhouse

			gasses
visible light (humans)	red - 700nm blue - 400 nm	10^{15}	you can see it white light is composed of various wavelengths
Ultraviolet (UV)	10^{-7}-10^{-8}	10^{16}	lowest frequency that is ionizing - causes cancer
X-rays	$<10^{-8}$	$>10^{17}$ x-ray microscope	-see your bones -created by high speed charged particles stopping
gamma rays	$<10^{-8}$	$>10^{17}$	-created from nuclear changes -tend to have very high energies

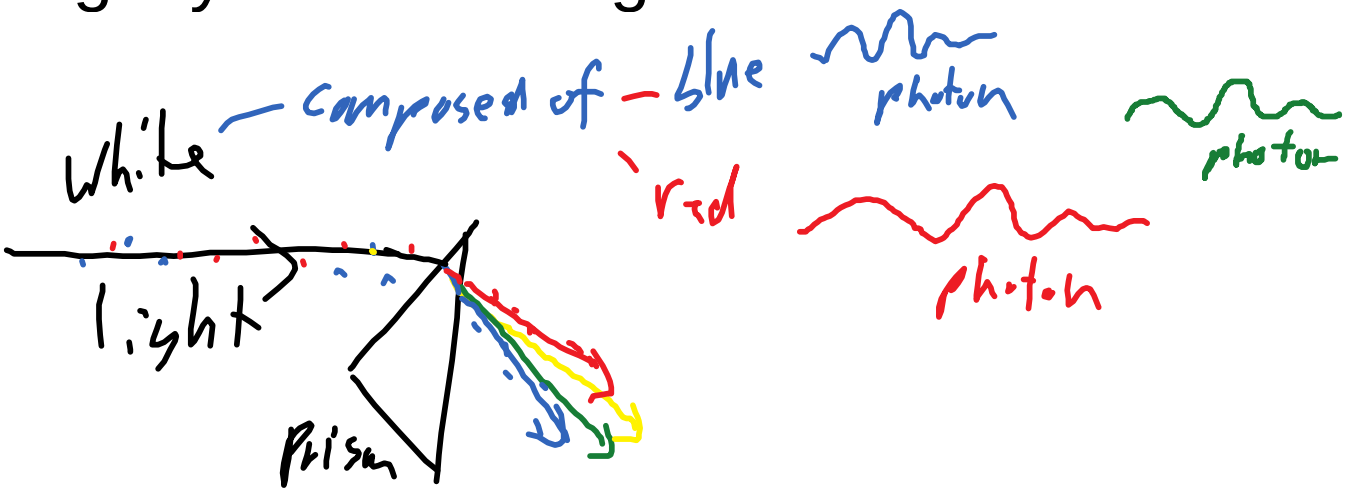
UV, X-rays, gamma rays - ionizing - cause

cancer in higher doses by damaging DNA

Electromagnetic radiation is created by:

1. Classical - changing electric fields - accelerating electrons for example
2. Quantum - charged particles "jump" energy states producing a photon of EM radiation of energy E=hf f is frequency and h is Planck's constant 6.626×10^{-34} Js

Because light is made of little particle waves and different wavelengths refract differently, when it goes through a prism or a water drop, you see a rainbow. The different wave/particles refract at slightly different angles.



all electro magnetic radiation moves at the speed of light in a vacuum

$c=3.00\times10^{8}m/s$

MHz

eg. you listen to the radio at 104.9FM, what is the wavelength of the radio signal?

104.9 FM = 104.9 MHz

$v = 3.00\times10^{8}m/s$

$v= \lambda f$ so $\lambda= v/f =$

$3.00\times10^{8}m/s/104.9\times10^{6}Hz$

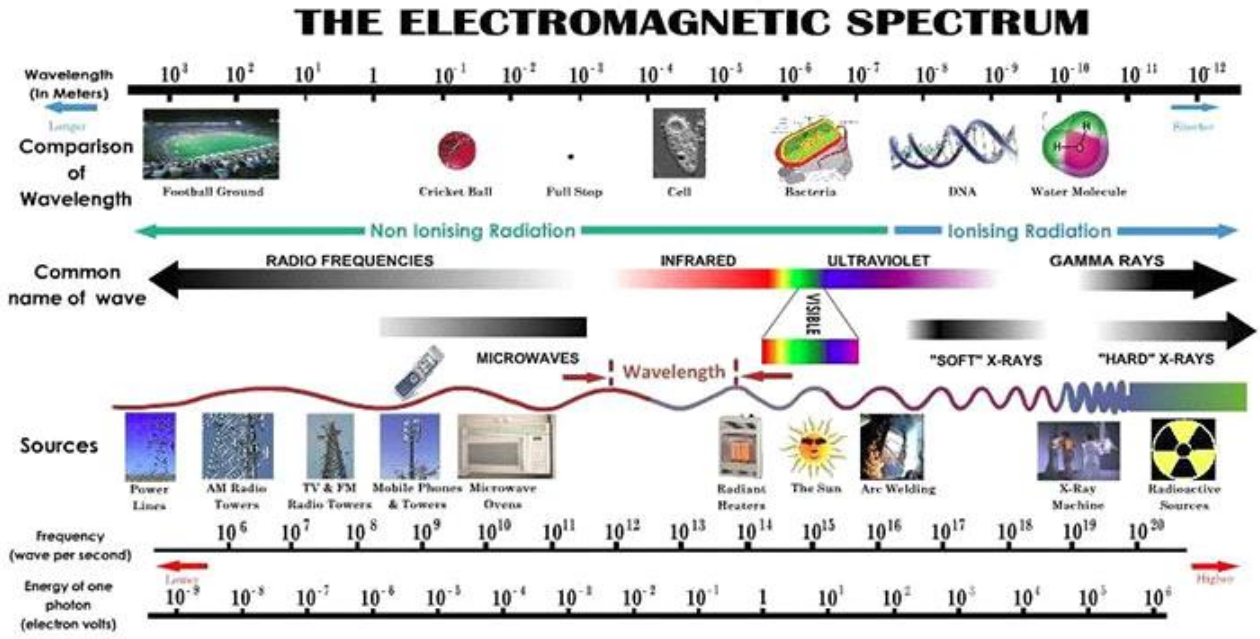
300/104.9=2.8599 m

2.86m

p332 practice problems 1-5

skip p333-336

p342 CR 2.1-2.4



Quiz:

Q2

a) frequency = #waves/time
1/0.357s or 1/0.674s

b) v = distance travelled / time to travel
= 15m / 3.7s or 4.7s

c) $v=\lambda f$ so $\lambda=v/f$ =answer to b/answer to a

Q3 frequency +/- the beat frequency but clay should add mass, so it should slow the frequency. frequency - beats
256-3 or 2 = 253 or 254Hz

4 closed tube $L=\lambda/4$ is the first length

a)

$\lambda=4xL$ $v=\lambda f$ = 4x(0.173 or 0.163m)x512

b) $L=3\lambda/4$ but using the same wavelength from a, so it is just 3xL of the first resonance 3x(0.173 or 0.163m)

c) different pressure, temperature, humidity - or experimental uncertainty?

5a)

$f' = f(v_w+v_o)/(v_w-v_s)$

$f' = 256Hz(343m/s+0)/(343m/s-10.0 \text{ or } 20.0m/s)$

b) change the sign of the v_s

$f' = f(v_w+v_o)/(v_w-v_s)$

$f' = 256Hz(343m/s+0)/(343m/s+10.0 \text{ or } 20.0m/s)$